REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants have incorporated the subject matter of claim 4 into claim 1, with the exception that the recitation that the epoxy resin can be an epoxy resin having a glycidyl ether part derived from resourcinol has been deleted from this subject matter from claim 4 inserted into claim 1. In light of the amendment of claim 1, claim 4 has been cancelled without prejudice or disclaimer.

Initially, it is respectfully requested that the present amendments be entered, notwithstanding finality of the Office Action mailed October 10, 2006. Thus, by incorporating subject matter of claim 4 into claim 1, it is respectfully submitted that the present amendments materially limit issues remaining in connection with the above-identified application, at the very least presenting the claims in better form for appeal, and, as set forth infra, providing the claims in allowable condition. As to the present amendments limiting remaining issues, clearly the amendments overcome the prior art rejection in Item 3 on pages 2-4 of the Office Action mailed October 10, 2006, as claim 4 was not rejected in this Item 3. As subject matter from claim 4 has been incorporated into claim 1, it is respectfully submitted that the present amendments do not raise any new issues, including any issue of new matter. Furthermore, noting new grounds for rejection on prior art in the Office Action mailed October 10, 2006, including application of a new reference, and also noting further arguments by the Examiner in this Office Action mailed October 10, 2006, it is respectfully submitted that the present amendments are timely.

In view of the foregoing, it is respectfully submitted that Applicants have made the necessary showing under 37 CFR 1.116(b)(3); and that, accordingly, entry of the present amendments is clearly timely.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the prior art applied by the Examiner in the Office Action mailed October 10, 2006, that is, the teachings of the U.S. patents to Gerdes, et al., No. 4,719,135, to Carlblom, No. 5,637,365, and to Tashiro, et al., No. 3,704,229, under the provisions of 35 USC 103.

It is respectfully submitted that these references as applied by the Examiner would have neither taught nor would have suggested such a fuel system as in the present claims, having the coating layer as recited in claim 1, the coating layer being formed by coating an epoxy resin composition comprising an epoxy resin and an epoxy resin curing agent as principal components, the coating layer having the specified gasoline permeability coefficient, and wherein the epoxy resin includes at least one selected from an epoxy resin having a glycidylamine part derived from metaxylylenediamine, an epoxy resin having a glycidylamine part derived from 1, 3-bis(aminomethyl)-cyclohexane, and an epoxy resin having a glycidyl ether part derived from bisphenol F; and wherein the epoxy resin curing agent comprises a reaction product of the following (A) and (B) or a reaction product of the following (A), (B) and (C):

(A) metaxylylenediamine or paraxylylenediamine;

(B) a multifunctional compound having at least one acyl group which can form an amide group part by reacting with polyamine to form a oligomer, the multifunctional compound being selected from the group

consisting of acrylic acid, methacrylic acid, and derivatives of acrylic acid, methacrylic acid, maleic acid, fumaric acid, succinic acid, malic acid, tartaric acid, pyromellitic acid and trimellitic acid; and

(C) monovalent carboxylic acid having 1-8 carbon atoms and/or a derivative thereof.

See claim 1.

In addition, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such fuel system as in the present claims, having features as discussed previously in connection with claim 1, and additionally wherein the gasoline permeability coefficient is 0.2g•mm/m^2•day or less (see claim 2); and/or wherein a skeletal structure represented by Formula (1) which is contained in the coating layer formed by curing the epoxy resin composition accounts for an amount of 30% by weight or more (see claim 3); and/or wherein the epoxy resin composition cured to form the coating layer includes the epoxy resin as in claims 5 and 6; and/or wherein the multifunctional compound (B) reacted in forming the epoxy resin curing agent is that set forth in claim 8; and/or area rate of the coating layer formed on the fuel vessel body, as in claim 9; and/or materials of the fuel vessel body or fuel vessel or molded part bodies, as in claims 10-14; and/or wherein the fuel system includes a tube body as in claim 15, with material of the tube body as in claim 16, especially with blending proportions of the epoxy resin curing agent to epoxy resin as in claim 17; and/or wherein the coating layer is formed on at least one of the connected parts as in claim 18, and/or reaction mole ratio of components of the curing agent as in claim 19; and/or blending proportion of epoxy resin curing agent to epoxy resin as in claim 20; and/or thickness of the coating layer as in claim 21; and/or wherein the multifunctional compound

reacted in forming the curing agent, is selected from the group consisting of the derivatives set forth in claim 1 (see claim 22).

The present invention is directed to a fuel system which includes at least one of various components such as, for example, a fuel vessel, molded parts for the fuel vessel and a tube for a fuel. In particular, the present invention is directed to such fuel system having excellent performance in preventing permeation of, e.g., gasoline, while having good heat resistance and impact resistance.

In recent years, use has been made of thermoplastic resins in fuel systems, as compared with use of metal, providing advantages of a reduction in weight, prevention of rust, ease in molding and ability to be recycled. However, in previously proposed fuel systems, various performances, such as heat resistance, water resistance, impact resistance, and avoidance of permeation of gasoline, has not been sufficiently satisfactory.

Against this background, Applicants provide a fuel system excellent in gasoline barrier property, heat resistance and impact resistance, and which also (when used in forming a tube of, e.g., rubber) has excellent flexibility. Moreover, the fuel system can be provided at relatively inexpensive cost, insuring a high profitability. Applicants have found that by forming the fuel system utilizing a thermoplastic resin and/or a rubber as the body of the fuel system, and providing a coating layer on at least one side of the body, the coating layer being formed by curing an epoxy resin composition including a specified epoxy resin and a specified epoxy resin curing agent as in present claim 1; and wherein the coating layer has a gasoline permeability coefficient of 2 g·mm/m^2·day or less at 60°C in a relative humidity of 60%RH, objectives according to the present invention are achieved. In particular, an excellent gas barrier property is achieved, the fuel system has

excellent heat and impact resistance, the coating layer has excellent adhesiveness to the body of thermoplastic resin, and the fuel system can be provided relatively inexpensively.

In particular, as described on pages 23 and 24 of Applicants' specification, by utilizing an epoxy resin curing agent, in the epoxy resin composition cured to form the coating layer, as in the present claims, a good adhesiveness of the coating layer to various materials, high gasoline barrier property, flexibility and heat resistance are achieved.

Moreover, using the specific epoxy resin as in the present claims, a high gasoline barrier property is achieved.

Note, e.g., the paragraphs bridging pages 18 and 19, and 19 and 20, of Applicants' specification.

Note that the multicomponent compound of (B) and the monovalent carboxylic acid of (C) respectively include compounds having at least one acyl group which can form an amide group part by reacting with polyamine to form an oligomer, the multifunctional compound being selected from a specified group of acids and derivatives, and monovalent carboxylic acids having 1-8 carbon atoms and/or a derivative thereof. As for these components (B) and (C), note the paragraph bridging pages 23 and 24, as well as the sole full paragraph on page 24, of Applicants' specification, describing illustrative specific materials as well as the derivatives.

Initially, note that the Examiner has not rejected claim 4 over the combined teachings of Gerdes, et al. and of Tashiro, et al. Note Item 3 on pages 2-4 of the Office Action mailed October 10, 2006. Again emphasizing that subject matter of claim 4 has been incorporated into claim 1, it is respectfully submitted that the

rejection of claims as set forth in Item 3 on pages 2-4 of the Office Action mailed October 10, 2006, is moot.

With respect to the rejection of claims as set forth in Item 4 on pages 4 and 5 of the Office Action mailed October 10, 2006, Gerdes, et al. discloses a coated polymeric article, e.g., a polyethylene substrate, having reduced permeability for fuels, particularly gasoline-type fuels, and characterized by a two component, preferably three component, varnish coat comprising: (a) an epoxy resin, e.g., preferably having an epoxy equivalent weight of about 150-280, (b) an effective amount of a specified amine-based curing agent as set forth in lines 3-11 of column 2, and preferably a third varnish component which is a flexibilizer, e.g., a suitable amount of isocyanate prepolymers, e.g., one based on an isocyanate prepolymer containing ether groups and urethane groups. Note the paragraph bridging columns 1 and 2 of this patent. See also column 2, lines 37-41. This patent discloses that suitable epoxy resins are those containing more than one epoxide group, e.g., 1.5-5, in the monomeric unit. See column 2, lines 56-58. Note also column 2, lines 59-68, for particularly suitable epoxy resins. Note also column 3, lines 1-35, for curing agents for use in forming the fuel impervious polymeric article of Gerdes, et al.

It is respectfully submitted that Gerdes, et al. requires an amine-based curing agent as set forth in column 2, lines 1-11; and it is respectfully submitted that this reference does not disclose, nor would have suggested, wherein the epoxy resin composition cured to form the coating layer includes an epoxy resin curing agent as in the present claims, comprising a reaction product of (A) and (B) or reaction product of (A), (B) and (C), or wherein the coating layer has the recited gasoline permeability coefficient.

In addition, it is respectfully submitted that Gerdes, et al. would have neither taught nor would have suggested such fuel system including the coating layer formed utilizing the epoxy resin and curing agent as recited in the present claims, and having the gasoline permeability as in the present claims and including other features as in various of the present claims in the application and referred to previously.

It is emphasized that Gerdes, et al. does not disclose, nor would have suggested, the epoxy resin utilized in forming the coating layer as recited in the present claims, much less the combination of such epoxy resin and curing agent, and advantages thereof as discussed in the foregoing.

It is respectfully submitted that the additional teachings of the secondary references as applied by the Examiner would not have rectified the deficiencies of Gerdes, et al. such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.

Tashiro, et al. discloses epoxy resin compositions having room temperature curability, the curing agent being sufficiently curable even in a wet state and having an improved compatibility with tar. The curing agent disclosed in this patent can be obtained by addition and condensation reactions of three components A, B and C, A being an acrylic or methacrylic acid ester, B being one of slightly water-soluble or insoluble aliphatic amines having a primary amine radical or an amine mixture thereof, and C being (a) a xylylene diamine having a specified structural formula and having both properties of aliphatic amine and aromatic amine, and (b) a 70:30 mixture of metaxylylenediamine and paraxylenediamine. See column 1, line 59 though column 2, line 16. Note also column 2, lines 17-49, describing how the components A-C of the curing agent are reacted.

Carlblom discloses resins having gas barrier properties, and packaging materials and/or containers including the barrier coatings, this patent disclosing that the barrier coatings substantially reduce permeability of gasses such as carbon dioxide and/or oxygen through packaging materials. The coatings disclosed in this patent are the cured reaction product of a polyamine with a polyepoxide having a specified structure. See column 2, lines 34-45. This patent discloses a packaging material being provided which includes at least one layer of a relatively gas-permeable polymeric material and at least one layer of a polyamine-polyepoxide barrier coating as disclosed in this patent. See column 4, lines 1-5. Note also the paragraph bridging columns 5 and 6 of this patent. Note also column 7, lines 41-51; and column 8, lines 51-53. See also column 10, lines 18-24.

Initially, it is respectfully submitted that the teachings of Gerdes, et al., as applied by the Examiner, would not have been properly combinable with the teachings of either of Tashiro, et al. or Carlblom. Thus, it is noted that Gerdes, et al. is directed to a fuel impervious polymeric article, facing the problem of providing such article without a primer or adhesion promoter. In contrast, Carlblom is directed to gas (such as oxygen and carbon dioxide) barrier coatings for use in packaging materials, addressing the problem of providing a barrier coating reducing the permeability of gasses such as carbon dioxide and/or oxygen through the packaging materials. Tashiro, et al. is directed to an epoxy resin curing agent which is sufficiently curable even in a wet state and having an improved compatibility with tar. In view of differences in technology in the teachings of the applied references, particularly with respect to the teachings of Gerdes, et al. and of Carlblom, and further in view of differences in problems addressed by each of these references, it is respectfully submitted that one of ordinary skill in the art concerned with in Gerdes,

et al. would not have looked to the teachings of either of Tashiro, et al. or of Carlblom, and particularly would not have looked to the teachings of Carlblom. In other words, it is respectfully submitted that the teachings of these references are directed to non-analogous arts.

In any event, particularly in view of the differences in technology in the teachings of the applied references, and also in view of differences in problems addressed by each, it is respectfully submitted that there would have been no proper motivation for combining the teachings of these applied references, as applied by the Examiner. Absent such motivation, it is respectfully submitted that the combination of teachings of these references as applied by the Examiner is improper under the guidelines of 35 USC 103.

The contention by the Examiner that Carlblom teaches structure for a fuel container, referring to column 1, lines 31-33, thereof, is noted. However, it is emphasized that Carlblom discloses, as the background of the invention therein, that, in addition to food applications, barrier coatings have utility for plastic medical ampoules and the like and for plastic fuel containers. More importantly, note column 4, lines 23-27 of Carlblom, describing that by the term "barrier material" as used throughout the description therein, "is meant that such a material has a low permeability to gases such as oxygen and/or carbon dioxide, i.e., the material exhibits a high resistance to the passage of oxygen or carbon dioxide through the material". This patent goes on to describe, in column 4, lines 32-34, that "low permeability to either carbon dioxide or oxygen as defined below is sufficient to qualify the material as a 'barrier material'". Thus, while, in the background of the invention, Carlblom discloses use of barrier coatings in general for plastic fuel containers, the barrier material described in Carlblom, taking the disclosure of

Carlblom as a whole, is directed to a material exhibiting high resistance of the passage of oxygen or carbon dioxide. It is respectfully submitted that the disclosure of this patent does not teach, nor would have suggested, resistance to passage of gasoline; and it is respectfully submitted that one of ordinary skill in the art concerned with in Gerdes, et al. would not have looked to the teachings of Carlblom, as discussed previously.

In any event, even assuming, arguendo, that the teachings of Gerdes, et al., Tashiro, et al. and Carlblom were properly combinable, it is respectfully submitted that such combined teachings would have neither disclosed nor would have suggested the presently claimed invention, including, in addition to the recited epoxy resin curing agent, wherein the coating layer includes an epoxy resin comprising at least one selected from an epoxy resin having a glycidylamine part derived from metaxylylenediamine or from 1,3-bis(aminomethyl)cyclohexane, and an epoxy resin having a glycidyl ether part derived from bisphenol F, and advantages achieved thereby.

The contention by the Examiner in the paragraph bridging pages 4 and 5 in the Office Action mailed October 10, 2006, that Carlblom teaches an epoxy comprising a glycidylamine part derived from metaxylylenediamine as a principal component and a cured epoxy having the claimed structure, the Examiner pointing to column 8, lines 51-63 of Carlblom, is respectfully traversed. First, it is respectfully submitted that there is no description regarding "an epoxy comprising a glycidylamine part derived from metaxylylenediamine" (emphasis added) in column 8, lines 51-60. What is taught in this portion is the residues which constitute the cured polymeric network. It is noted that the residue disclosed in column 8, line 55,

is taught to be derived from xylylenediamine, and is not taught to be derived from an epoxy resin comprising a glycidylamine part derived from metaxylylenediamine.

It is respectfully submitted that the coatings of Carlblom are the cured reaction product of a polyamine with a polyepoxide having the structure set forth in line 45 of column 7, or the structure set forth in line 55 in column 7. It would appear from these structures that the polyepoxides of Carlblom include no polyamine residue. Thus, contrary to the contention by the Examiner, it is respectfully submitted that the polyepoxide of Carlblom does not have a glycidylamine part derived from metaxylylenediamine.

In addition, it is respectfully submitted that Carlblom teaches that the polyamines such as xylylenediamine are for reacting with the polyepoxides, for curing the coatings. Note the paragraph bridging columns 2 and 3 of Carlblom. Namely, it is respectfully submitted that Carlblom teaches that xylylenediamine is used as a curing agent for the polyepoxides, not a component for constituting the polyepoxide.

In view of the foregoing, it is respectfully submitted that the Examiner errs in construing Carlblom as describing an epoxy including a glycidylamine part derived from metaxylylenediamine; and that, properly construed, the teachings of the applied references would have neither disclosed nor would have suggested the presently claimed subject matter, including, inter alia, the epoxy resin used in forming the coating layer of the present claims, much less wherein the coating layer is a product of such epoxy resin and the specific curing agent as in the present claims, and wherein the coating layer has the gasoline permeability as in the present claims, and advantages thereof.

Furthermore, note that presently amended claim 1 recites that the epoxy resin can also be an epoxy resin having a glycidylamine part derived from 1,3-bis(aminomethyl)cyclohexane. In contrast, Carlblom discloses that the residues constituting the cured coating include phenylene or naphthylene. Clearly, Carlblom teaches away from using a diamine having an alicyclic ring structure, as in one of the epoxy resins in the present claims.

It is also to be noted that the present claims recite that the epoxy resin can be an epoxy resin having a glycidyl ether part derived from bisphenol F. It is respectfully submitted that R in the polyepoxides of Carlblom is phenylene or naphthalene, and that such polyepoxides of Carlblom would have neither taught nor would have suggested the claimed structure formed using the epoxy resin having a glycidyl ether part derived from bisphenol F, as in the present claims.

In view of the foregoing comments and amendments, entry of the present amendments, and reconsideration and allowance of all claims then pending in the above-identified application, are respectfully requested.

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Applicants request any shortage in fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 396.42795X00), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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